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ABSTRACT

The purpose of this presentation is to describe the Classroom Process Scale (CPS) and its usefulness for the assessment of teaching effectiveness. The CPS attempts to ameliorate weaknesses in existing classroom process measures by including a coding of student involvement in learning, objectives being pursued, and methods used to pursue attainment of the objectives. The CPS has been found to be a highly objective and valid indicator of the classroom process. The discussion focuses on the use of the CPS in current research studies. The authors conclude with a discussion of practical and theoretical uses of the CPS. (Authors)

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The Classroom Process Scale (CPS): An Approach to the Measurement of Teaching Effectiveness

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The Classroom Process Scale (CPS):
An Approach to the Measurement of Teaching Effectiveness

Introduction

Considering that research on teaching has typically produced equivocal results (Dunkin and Biddle, 1974), perhaps it is presumptuous to even approach the measurement of something called "teaching effectiveness". Presumptuous first because the Classroom Process Scale (CPS) is based on a set of assumptions about teaching; and second, because the CPS represents biases about both observing and measuring teaching effectiveness in the classroom. As a consequence, the CPS is not a method for scientifically dissecting the craft of teaching. Rather, it is simply an application of Cronbach's (1975) admonition to observe effects in context and to pinpoint which simultaneous actions of situational variables produce a particular effect. The CPS is, therefore, a chronicle of the classroom process which would, as Cronbach asserts, compel the observer to be a journalist, not a dramatist.

This presentation of the Classroom Process Scale focuses on the following six topics: 1) the assumptions underlying the CPS; 2) the format of the CPS; 3) the coding of CPS observations; 4) the types of displays for the CPS information; 5) the prior investigations which have used the CPS as an observational tool; and, 6) implications for the future use of the CPS in both classroom practice and school learning research.

Assumptions Underlying the Classroom Process Scale

There are three types of assumptions underlying the CPS. The first involves the nature of the classroom process, the second deals with the observation of the classroom process, and the third pertains to possible

uses of the observation information. Each assumption seems to have evolved from very general questions about both classroom teaching and observation techniques. These questions are:

1. What types of content and/or objectives are taught in virtually all classrooms?
2. What methods are used to teach the content and/or objectives?
3. When is teaching successful?
4. What type of observational schemes can measure the effectiveness of the classroom process?
5. What training and/or skills are required for classroom observers?
6. What type of information from a classroom observation would be useful to teachers?
7. Of what potential benefit is information derived from classroom observation to students?

While the first three questions indirectly address the nature of the classroom process, questions four and five deal with its observation. The last two questions concern the utility of classroom process observation for both teachers and students.

1. Assumptions about the Nature of the Classroom Process

The classroom process includes the activities involved in teaching and learning intended content and/or objectives. Since teachers typically enter classrooms with content based instructional plans, the first question, "What types of content and/or objectives are taught in virtually all classrooms?", seems an appropriate beginning.

The question indicates that a categorization of instructional content and/or objectives is to be independent of academic discipline and subject matter. Three types of content tend to underly virtually all

subject matter as taught at virtually all grade levels. These three types of content can be categorized as information, concepts or procedures (Anderson, 1977). In a similar manner, objectives can be categorized as informational objectives, conceptual objectives, and procedural objectives. The objectives are categorized on the basis of their underlying content classification.

The information content category represents facts and generalizations which can be learned independently from other content. These facts, therefore, neither depend upon previously learned content nor greatly affect subsequent learning. An example of such factual information is that Denver is the capital of Colorado.

The concepts content category represents the meaning of what is taught (Carroll, 1964). Teaching conceptual content requires presenting both definitions and distinguishing characteristics of the concept as well as its relationship to previously learned concepts. As a result, concepts form a basis for categorizing, comparing, or contrasting information and are, therefore, essential for subsequent learning. An example of a concept is a graph. By definition, graphs are displays or diagrams of interrelationships among points, each of which are distinguishable and are connected by the same type of lines. One type of graph is a bar graph.

The procedures content category represents either a series or a sequence of steps, each of which must be performed in order to complete a task or solve a problem. There are general procedures such as the one used to write a cohesive paragraph. There are also specific procedures such as the one used to solve a quadratic equation.

In sum, since a fundamental component of an instructional plan is the content and since all instructional objectives can be defined in terms of content, one aspect of the classroom process seems to be the type of content being taught at a particular point in time. Whether students actually acquire the relevant content or achieve the intended instructional objectives, however, may be partially due to the teaching methods used.

Teaching methods are the basis for the teaching component in the classroom process. The second general question (above), "What teaching methods are used?", presupposes that one or more identifiable methods are used to aid student attainment of the instructional objectives. Reviews of research on teaching (Dubin and Taggevia, 1968; Dunkin and Biddle, 1974) coupled with our own observations (Anderson and Scott, in press) indicate that teaching methods for virtually all grade levels and subject areas can be classified into one of the following presentations: lecture, demonstration, classroom discourse, discussion, seatwork, recitation, and audio-visual recordings. Although each type of teaching method can be both defined (as in the section of this paper entitled "Format of the CPS") and observed, the utility of categorizing teaching methods has not been demonstrated.

As Dunkin and Biddle note, "While different types of lessons are quite 'different', there is no conclusive evidence to support the differential effectiveness of a single method" (p. 211). However, none of the studies reviewed by Dunkin and Biddle investigated the relationship between what is being taught (type of content) and the manner in which it is being taught (teaching method). The issue here is not one of

determining a "best" method or combination of methods. Rather, if three types of content are generally the basis for the classroom process, which methods are critical for teaching a particular type of content and/or objective?

The extent to which a method may be "critical" underlies the third general question, "When is teaching successful?". Given that even the best plans can be shattered in the classroom, teaching would seem to be successful to the extent that students become, and continue to be, engaged in learning. Thus student behaviors in the classroom are essential elements of the classroom process.

Student involvement in learning, the final component of the classroom process, has been found to correlate with measures of student achievement within a range of .40 to .65 (Lahaderne, 1968; Cobb, 1972; Anderson, 1975; and McKinney et al., 1975). Each of these studies used a systematic observation of those student behaviors which appear to be relevant to the learning task.

Thus, it would seem that because the teaching process involves implementing an instructional plan, the process can be judged successful to the extent that students are engaged in learning. The design of an instructional plan, on the other hand, is better judged by the extent to which students achieve the instructional objectives. The distinction is, consequently, an example of product vs. process evaluation. Where classroom assessment exercises measure both teaching and learning results, classroom observation schemes should measure both teaching and learning activities.

In sum, then, the classroom process contains at least three components: what is being taught, how it is being taught, and the reaction of the student to the teaching.

2. General Characteristics of Classroom Observation Scales

In regard to question four, "What types of classroom observation scales can measure the effectiveness of the classroom process?", few schemes seem to have been constructed to examine the classroom process as a simultaneous activity involving both teaching and learning. Of the many, widely used scales, most seem inappropriate for this joint type of measurement for the following reasons.

First, a large number of the scales are designed as "dyadic" measures (e.g., Flanders, 1970). With a dyadic instrument, the observer focuses on a one-to-one interaction between the teacher and an individual student. During an entire class period, however, often only a small proportion of the classroom process, as low as 10 percent, has been found to involve dyadic interactions (Anderson and Scott, 1977). A dyadic type of observation schedule cannot, therefore, be considered representative of the entirety of the classroom process. Rather, it seems more appropriate for observing individual or small group tutorial situations than large, group-based classroom instruction.

Second, observation scales are not typically designed for the simultaneous observation of teaching and learning activities. The joint observation of these two variables seems necessary if the entire classroom process is to be measured. That is, a measure of student involvement seems of relatively little use when there is no corresponding measure of the activity intended for student involvement, and vice

versa. Thus, where dyadic observations tend to measure only a segment of the classroom process, nonsimultaneous observations of teaching and learning eliminate one entire dimension of the process.

Third, observation scales generally do not account for the type of content and/or objective which provides the framework for the selection of teaching and learning activities by teachers. Perhaps different teaching methods are appropriate for different types of content and/or instructional objectives. Or, whereas student involvement in learning may not vary according to the teaching methods used within a type of content and/or objective, student involvement may differ substantially among content and/or objectives. Thus, it would seem that since content and/or objectives provide the basis for an instructional plan, content and/or objectives should be the basis for observation.

In addition to the three major reasons that most classroom observation scales seem inappropriate for measuring the classroom process, there is a final consideration. The fifth question, "What training and/or skills are required for classroom observation?", addresses the concerns for ease in coding and objectivity. Classroom observation research generally does not detail the amount of training or prerequisite skills necessary to use an observation scale. Nevertheless, it would seem that the simplicity of the coding procedure is directly proportional to observers' objectivity. As a consequence, coding classroom process observations should be relatively simple. The primary training for coding these observations should be learning the definitions of the activity categories to be coded and obtaining practice in using the scale.

To summarize, the characteristics of most classroom observation scales seem to pose difficulties for observing the entirety of the

classroom process. Based on these considerations, a useful observation scheme should include a coding of the type of objective, or content, being pursued and the method used to pursue it. Since some of the classroom time may be devoted to administrative activities, the scheme should also include a coding of non-instructional activities. Finally, a useful observation should include a coding of learner activities that are deemed either relevant or interesting to observe. These three types of observations should be relatively simple to code and easy to decipher.

3. Possible Uses of Classroom Process Observation

In reference to question six, "What type of information from a classroom observation would be useful to teachers?", an observation scale should provide the following types of information. First, it should provide the teacher with a general portrayal of the group's involvement during the instructional period. Second, the scale should provide information about the involvement of particular students that can be related to the entire classroom process. That is, the observation should indicate particular students' involvement during an instructional activity for a particular type of objective. Both types of information could then be used as a basis for determining the effectiveness of teaching methods for the entire class in general and for individual students in particular. Presumably, those activities which consistently elicited a low degree of student involvement would be the ones subject to revision. Hence, students may benefit from a classroom observation (question seven) as a result of teachers using those methods which seem to have potential for high student involvement and discarding those which do not.

Format of the Classroom Process Scale

The Classroom Process Scale was constructed on the basis of the assumptions mentioned in the preceding section. As a consequence, there are two independent variables to be coded on the CPS: type of content presented and type of teaching method.

"Type of content" refers to the type of learning students are supposed to attain with the aid of materials and methods. Based on the previously stated definitions of the three content types (page 3), the learning intended for each content category in the CPS is as follows: 1) information requires the student to recall facts and generalizations; 2) a concept requires the student to classify information; and, 3) procedures require the student to manipulate serial or sequential information.

"Type of teaching method" represents general categories of instructional materials and activities. In the CPS teaching methods are categorized as:

1) the lecture method, which refers to the teacher's predominantly verbal presentation of instructional material;

2) the classroom discourse method, which refers to a series of teacher question-student response situations in which the teacher, in addition to asking questions, uses the students' answers as a springboard for mini-lectures on the material;

3) the seatwork method, which is characterized by individual students working on an assigned task at their desks. The task may have been either a writing or reading assignment;

4) the group work method, which is characterized by two or more students working together on an assignment;

5) the discussion method, which is characterized by students' verbal exchange. The teacher interrupts the dialogue to either allow another student to participate or to focus the dialogue on the intended topic;

6) the audio-visual method, which is characterized by using a medium such as film strips, slides, and audio recording for group instructions; and,

7) the recitation method, which refers to students orally reviewing previously learned material, either as a group (i.e., chant) or individually.

Because some of the classroom activities are non-instructional, categories of "administration" and "none" are used to denote these activities.

The dependent variable coded on the CPS is student involvement in learning. Student involvement in learning refers to the amount of time the student is engaged in task relevant behavior. Anderson's (1976) observation schedule is used to categorize student behavior as task-relevant or non-task-relevant.

The arrangement of the three classroom process variables used in the original CPS is displayed in Figure 1.

Method of Coding CPS Observations

The CPS can be used by either two observers working together in coding the classroom process or by a single observer trained in coding both student and teacher behaviors.

When there are two observers, one watches the behavior of randomly pre-selected students. Each student is observed for five seconds and one second is taken to code his behavior into one of four categories: paying attention to the task, working alone on the task, working with significant others on the task, and engaging in behavior that is not relevant to the learning task. Every minute ten students are observed and coded. For each minute, then, a percent of the observed students who are involved in learning can be computed. Also, over all of the instructional minutes, a percent of time-on-task for each student can be computed. Meanwhile, the second observer is watching and listening to the teacher. Every thirty seconds the intended focal point of

student attention and the nature of the instruction are observed. This observation is coded in two parts. First, the type of content and/or objective intended for student learning is coded in one of the three categories (i.e., information, concepts, and procedures); then, the type of teaching method used to communicate the content is coded in one of seven categories (i.e., lecture, discussion, seatwork, etc.). This method of coding permits teaching activities to be coordinated with student task-relevant activities for each 30 second period of classroom time.

When there is a single observer coding both teacher and student activities, the amount of observation time per code is 10 seconds. The observer watches each student and listens to the teacher for 8 seconds. The behavior of the student and the instructional activity are then coded in the manner described above. Every minute, therefore, six students are observed and coded. Like the two-observer method, the single-observer coding method permits a percent of time-on-task in each type of teaching activity to be computed over all the instructional minutes for each student.

Displays of CPS Information

The type of display selected to communicate information obtained from the CPS is a function of the purpose for which the CPS is used. There are two general purposes for using the CPS. One is to collect observation data on an individual classroom; the other is to collect data on a group of classrooms.

If the CPS is used to obtain information about a particular classroom, then the teacher is most likely the audience intending to use that

information. As a consequence, a graphical display, as presented in Figure 2, is probably the most useful. Pictorially, a graph indicates the extent to which students were engaged in learning during each type of teaching activity.

If, on the other hand, the CPS is used to obtain information about a group of classrooms, then instructional counselors and researchers are the most likely audience. A tabular display of the information, such as the one in Table 1, is probably the most useful in this instance since the relevant statistics are presented. Numerically, the table indicates the effectiveness of teaching methods across classrooms and/or different types of students. Where the characteristics used to distinguish students are few, a graphical depiction of the tabular information may also be helpful. An example of a graphical display for group information is presented in Figure 3.

Prior Investigations Using the CPS

The CPS has been extensively pilot tested. Also, it has been used in one study and is being used in two additional studies. The major purpose of the pilot testing was to ascertain the feasibility of using the CPS. This included both administrative feasibility and the extent to which several observers agreed in their coding. The results were quite positive. The average on-site inter-rater agreement for the student observations was 91 percent. For the teacher observations, the average on-site inter-rater agreement was 88 percent.

In the study that has been completed (Anderson and Scott, 1977), the CPS was used for 101 ninth through twelfth grade students enrolled in a single suburban high school. The purpose of the study was to

ascertain if there were particular types of teaching methods which are differentially related to the involvement in learning of different types of students. Five types of teaching methods were identified: lecture, classroom discourse, seatwork, group work, and audio-visual. Six types of learners were identified on the basis of their scholastic aptitude and academic self-concept: high aptitude, high self-concept; high aptitude, low self-concept; medium aptitude, high self-concept; medium aptitude, low self-concept; low aptitude, high self-concept; and low aptitude, low self-concept. The results of the study indicated that students with low aptitudes and low academic self-concepts seem to be the most influenced by differences in teaching methods. Further, teaching methods which emphasize "one-way" communication (e.g., audio-visual and lecture) tended to maximize differences in student involvement among students at different levels of scholastic aptitude. While high aptitude students were involved at a high level, low aptitude students were not. Teaching methods which place the burden of responsibility for learning on the student (e.g., seatwork) tended to maximize differences in student involvement between students at the different levels of academic self-concept. Finally, those teaching methods which emphasize "two-way" communication and a sharing of responsibility for learning (e.g., classroom discourse, group work) tended to be associated with small differences in student involvement among the various groups of learners.

One study in progress using the CPS involves a single observer coding of approximately 60 students in the fourth grade at one rural elementary school. The purpose of the study is to ascertain whether particular teaching methods are more appropriate for particular types of content.

Based on an inter-rater agreement of 98 percent for both teaching methods and student behaviors, which was obtained during eight hours of pre-study observation, a preliminary analysis of the data indicates the following results.

First, three of the four teachers taught for informational objectives and procedural objectives during each of 10 observed classes. Approximately 77 percent of the time was spent on seatwork and recitation activities. The remaining time was spent in classroom discourse, lecture, and discussion activities. The fourth teacher, on the other hand, spent the majority of each class period teaching conceptual objectives. A recitation and seatwork activities were used in this class as the final activities in the instructional period. The recitation and seatwork activities were used to teach for informational objectives.

Second, students were found to be involved in learning to a greater extent when classroom discourse was used to teach conceptual objectives than when the classroom discourse method was used to teach for informational objectives. Where an average of 87 percent of the student were found to be on-task during classroom discourse for concepts, only 53 percent of the students were on-task during classroom discourse for information.

Third, when procedures were taught using first a demonstration, then a classroom discourse and finally activities alternating seatwork and classroom discourse, 93 percent of the students were found to be on-task for the entire instructional period. This finding does not include, however, class time that was used for administrative activities. Finally,

approximately 15 percent of each class period was used for non-instructional activities.

Implications for Future Use of the CPS

Considering the CPS is designed to "observe effects in context", the context is the type of content and/or objective being taught. The effects are the joint activities of teaching and learning which occur during the implementation of an instructional plan. In terms of classroom practice, the CPS might be used to identify teaching methods which are effective for a particular group of students. Consequently, ineffective methods could be eliminated.

The CPS can also be modified and used to determine the extent to which an instructional plan is being implemented appropriately. Much of the research on classroom instruction has compared Method A with Method B, ignoring possible differences in the implementation of the methods by different teachers. Hence, there is often large within-method variance. Significant differences between methods are made more difficult to identify because of these large within-method variances. Through the use of the CPS classrooms in which the plans are not being implemented as designed can be identified and eliminated from the study.

In terms of school learning research, the CPS can be used to answer several important questions concerning classroom instruction. Examples of such questions would include:

1. What is the relationship between various student entering characteristics and the percent of time they spend in the classroom engaged in learning?

2. Are there different instructional methods that are differentially effective for different instructional objectives?

3. Are there different instructional methods that are differentially effective for different types of learners?

4. What is the optimal length of various teaching methods in terms of student involvement in learning? That is, can teaching methods be categorized with respect to the length or time they can be used before student involvement in learning begins to fade?

To the extent that the classroom process is an important element in understanding classroom instruction, ways must be found to gather information about the classroom process. To this date, instruments capable of gathering information about the entirety of the classroom process have been unavailable. The Classroom Process Scale described in this paper is highly recommended as an instrument to fill this apparent void.

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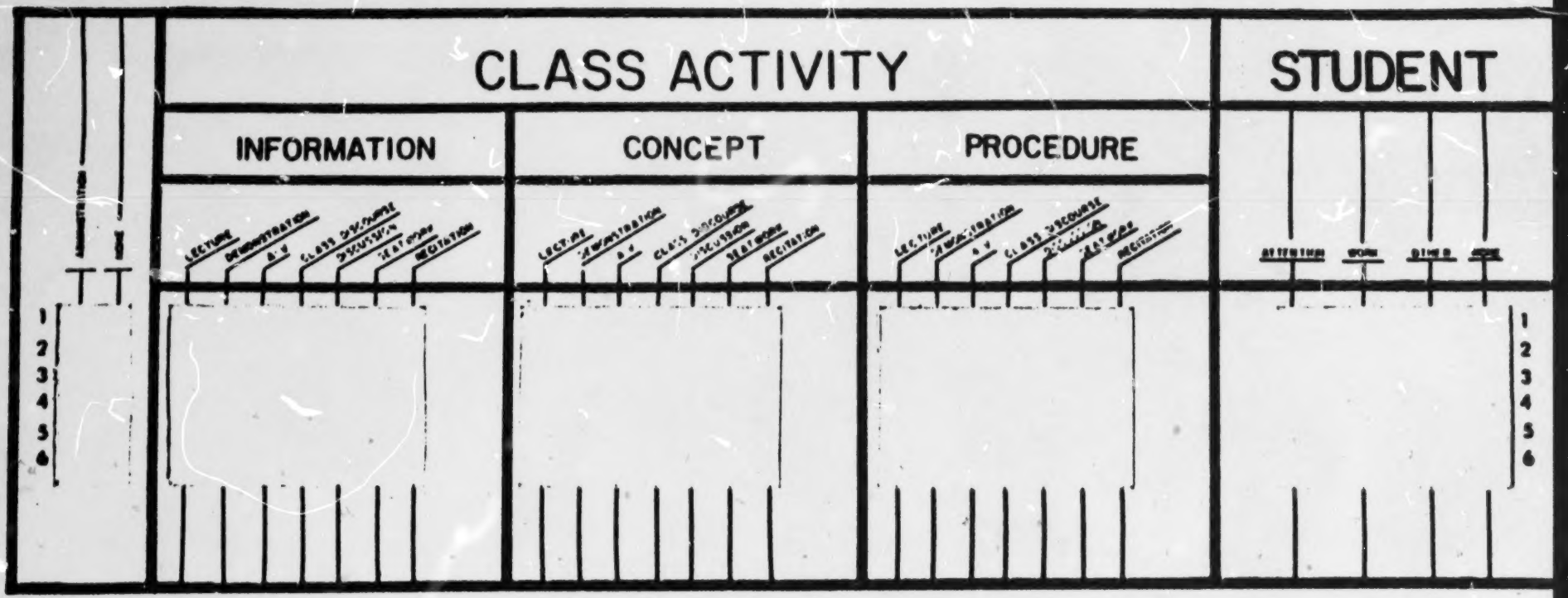

Fig. 1 -- The Classroom Process Scale

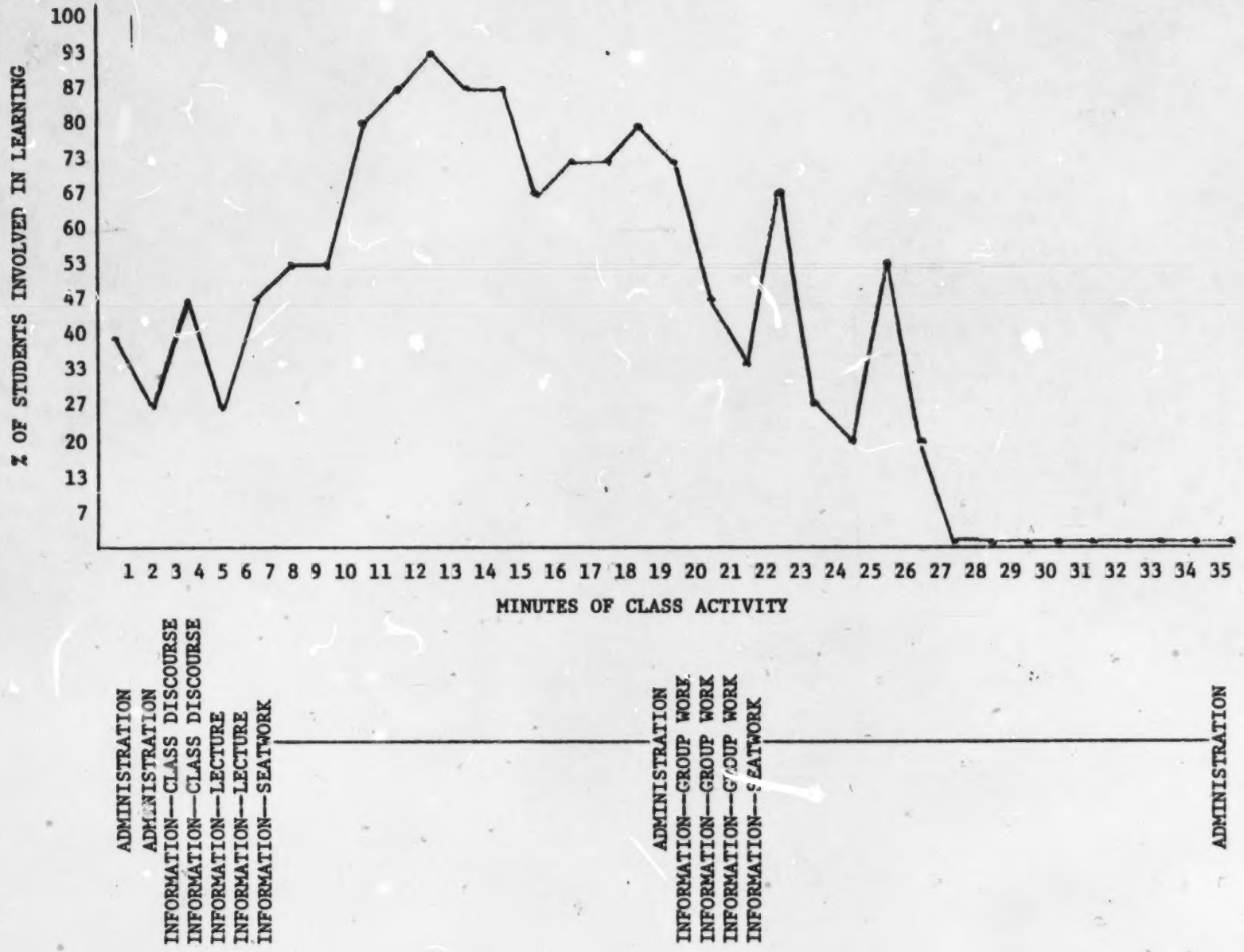

Fig. 2 -- Average Student Time-On-Task During a Class Period

Table 1

Percentage of Time Spent by Teachers in Various Types of Teaching Methods and Associated Means and Standard Deviations of the Per Cent of Student Involvement in Learning (TOT)

Type of Teaching Method	TEACHER 1			TEACHER 2			TEACHER 3			TEACHER 4		
	% Total Time Using Method	% Student TOT		% Total Time Using Method	% Student TOT		% Total Time Using Method	% Student TOT		% Total Time Using Method	% Student TOT	
		Mean	S.D.		Mean	S.D.		Mean	S.D.		Mean	S.D.
Lecture	48.9	60.7	13.1	73.2	68.1	12.7	35.8	49.8	20.5	44.4	44.7	19.1
Classroom Discourse	10.6	58.0	20.4	8.9	67.4	18.4	0.7	78.5	32.3	5.8	54.8	17.6
Seatwork	18.2	63.7	13.1	4.5	28.3	34.5	50.5	56.6	19.1	21.4	60.5	21.6
Group Work	1.2	53.0	35.5	0.0	--	--	0.0	--	--	0.5	26.4	38.9
Audio-Visual	5.3	74.6	19.3	4.2	82.6	19.9	0.0	--	--	14.9	51.2	40.7
Procedures	15.3	44.8	11.0	9.2	34.1	11.1	13.0	28.6	8.7	13.0	28.9	14.4

NOTE: TOT is the abbreviation for time-on-task, or student involvement in learning.

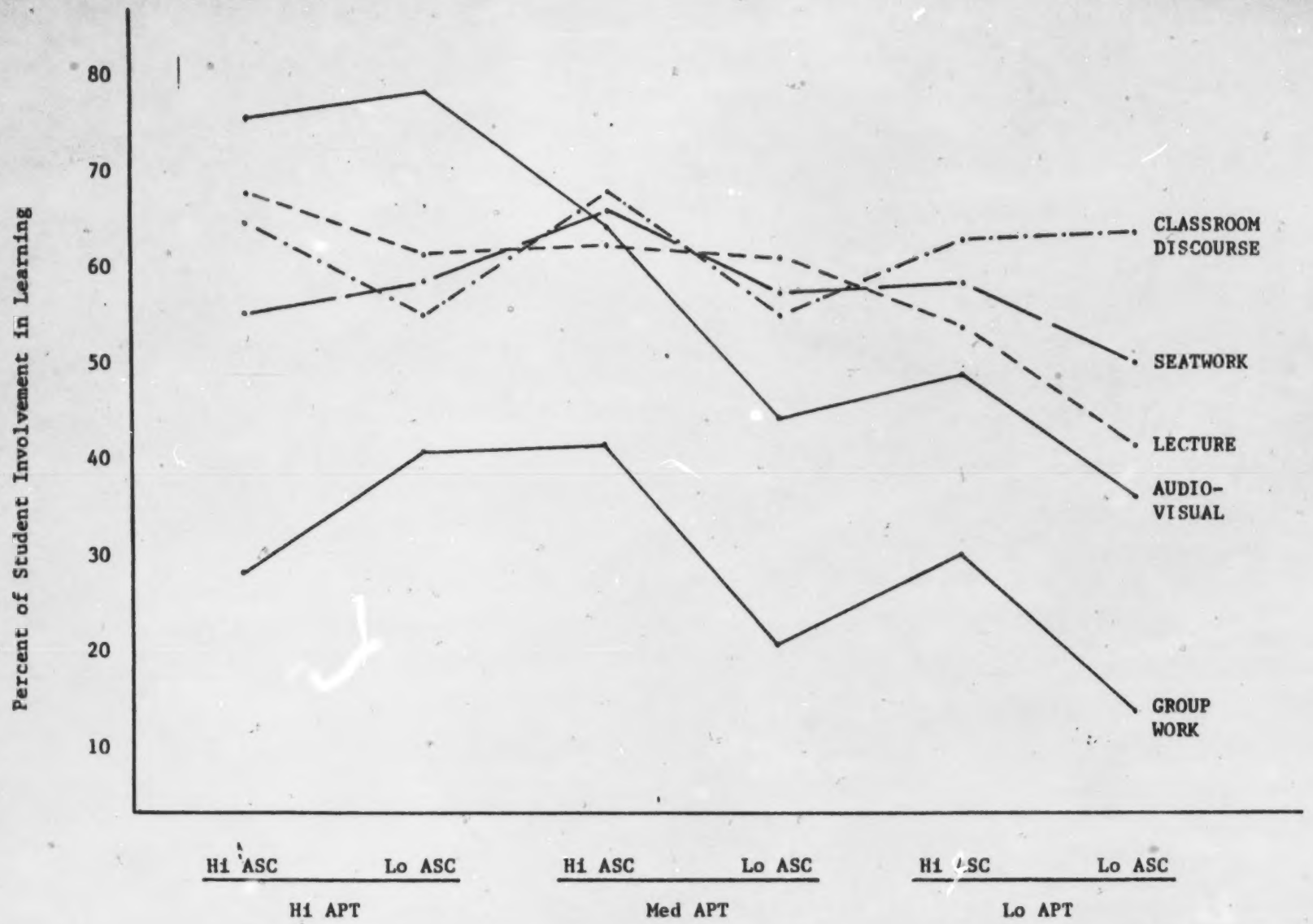

Fig. 3 -- Student Involvement Levels for Different Types of Learners Learning Under Different Teaching Methods